GULF, COLORADO & SANTA FE RAILWAY UNDERPASS
Atchison, Topeka & Santa Fe Railroad Underpass
Texas Historic Bridges Recording Project II
Spanning E. Rosedale Ave. at the Atchison, Topeka & Santa Fe Railroad
Fort Worth
Tarrant County
Texas

HAER No. TX-95

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WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
U.S. Department of the Interior
1849 C St. NW
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HISTORIC AMERICAN ENGINEERING RECORD

GULF, COLORADO & SANTA FE RAILWAY UNDERPASS HAER No. TX-95
(Atchison, Topeka & Santa Fe Railway Underpass)

Location:	Spanning East Rosedale Avenue at Atchison, Topeka & Santa Fe Railroad, Fort Worth, Tarrant County, Texas UTM: 14/657270/3622990 USGS Quad: Fort Worth, Tex.
Date of Construction:	1936
Designer:	Gulf, Colorado & Santa Fe Railway
Fabricator:	Virginia Bridge & Iron Company, Roanoke, Virginia
Builder/Contractor:	Gulf, Colorado & Santa Fe Railway Company; and West Texas Construction Company, Fort Worth, Texas
Present Use:	Railway underpass
Significance:	The first Gulf, Colorado & Santa Fe Railway Underpass at East Rosedale Avenue was constructed in 1910, along with the nearby Missouri, Kansas & Texas Railroad Underpass and the Houston & Texas Central Railway Underpass, as part of a joint grade separation project by the three companies. Reconstruction of the structure in 1936 was part of a systematic attempt by the Texas Highway Department and the U.S. Bureau of Public Roads to improve urban-area grade separation structures in response to the explosive growth of automobile and truck traffic during the 1920s and 1930s.
Historian:	Robert W. Jackson, Ph.D., August 2000
Project Information:	This document was prepared as part of the Texas Historic Bridges Recording Project II performed during the summer of 2000 by the Historic American Engineering Record (HAER). The project was sponsored by the Texas Department of Transportation (TxDOT), Environmental Affairs Division

The Gulf, Colorado & Santa Fe Railway (GC&SF) Underpass spanning East Rosedale Avenue in Fort Worth, Texas, was built in 1936 as part of a systematic attempt by the Texas Highway Department and the U.S. Bureau of Public Roads during the 1930s to improve urban-area grade separation structures. This effort was in response to the explosive growth of automobile and truck traffic during the early decades of the twentieth century, which led to dangerous conflicts at points of intersection between road and rail transportation systems. It replaced a similar structure constructed in 1910, along with the nearby Missouri, Kansas & Texas Railroad (MKT) Underpass and the Houston & Texas Central Railway (H&TC) Underpass, as part of a joint grade separation project by the three companies. This project represented an early attempt to eliminate points of conflict where rights-of-way of the dominant nineteenth-century mode of transportation (the railroad) intersected paths of an emerging twentieth-century mode of transportation (the automobile).

The roots of this conflict in the Fort Worth area may be traced to the rail promotion activities of civic, business, and political leader Buckley Burton Paddock (1844-1922). As editor of the Fort Worth *Democrat*, Paddock published the so-called "Tarantula Map" on 26 July 1873, which depicted nine railroad lines radiating like a spider's legs from Fort Worth. Although there were no railroads terminating in Fort Worth when the map was first published, it served as a visual representation of the hope that Paddock and other civic boosters had for their city's future.

Due in large part to Paddock's vigorous promotion at the local, state, and national levels, the Texas & Pacific Railroad succeeded in completing the first rail line into Fort Worth on 19 July 1876. Seven other railroads completed lines into the city during the following decade, including the MKT in 1880, the GC&SF in 1886, and the Fort Worth & New Orleans in 1886. The H&TC Railway acquired the latter company in 1902.[1] Arrival of the International & Great Northern Railroad in 1903 essentially completed the network of railroads envisioned by Paddock in 1873. This pattern of rail lines was therefore well established by dawn of the automobile age.

A rapid increase in automobile ownership during the first decade of the twentieth century led to a dramatic rise in fatalities and serious injuries at points where rail lines crossed roads. Warning signs were often inadequate or non-existent, and the motoring public was generally ignorant of the danger posed by trains. Railroad corporations usually defended the their right-of-way as paramount, and blamed motorists for the accidents that occurred. Reluctant to spend the great amounts of money necessary for a systematic program of grade separation, the railroads generally consented to build structures on a case-by-case basis only when forced to do so by city or county governments.

On 8 August 1908, in an attempt to eliminate the especially hazardous situation on East Rosedale Avenue between South Main Street and Evans Avenue, where three rail lines crossed the heavily traveled arterial in close proximity, the City of Fort Worth Board of Commission instructed the city attorney to prepare an ordinance requiring the GC&SF, the H&TC, and the

[1] Marcelle Hull, "B. B. Paddock and the Railroads of Fort Worth," *The Compass Rose* 9, no. 1 (Spring 1995), 1-5; Ron Tyler, ed., *The New Handbook of Texas,* vol. 5 (Austin, Tex.: Texas State Historical Association, 1996), 5; Charles P. Zlatkovich, *Texas Railroads: A Record of Construction and Abandonment* (Austin, Tex.: Bureau of Business Research, University of Texas at Austin, 1981), 69, 74.

MKT to build three grade separation underpasses. The railroads companies delayed until October 1909, at which point they finally agreed to act as requested.

The roadway was slightly depressed to keep the rail lines at their existing grades. A motorist traveling down East Rosedale Street from east to west passes under the MKT Underpass, the H&TC Underpass, and then the GC&SF Underpass. All three structures were completed in 1910.

In each case, a steel deck plate girder was used to span the road. Use of this structure type by railroad companies for short span bridges was common by 1910, due to the superiority of plate girders over articulated trusses. Plate girders generally cost less to manufacture, erect, and maintain, tended to resist shock better due to their compactness, and had fewer critical points where overstress was likely to occur due to faults in design and workmanship.[2]

Wood trestle approaches were also erected at both ends of the GC&SF Underpass, while the H&TC Underpass had a wood trestle approach at the south end and an earth embankment approach on the north end, maintained by a concrete wingwall. The MKT Underpass had earth embankments at both ends, maintained by concrete wingwalls. A masonry drainage or pass-through structure is also located just south of the south trestle of the GC&SF Underpass.

Although construction of these underpasses marked a considerable improvement in the safety of the street, accidents continued to occur due to the existence of a concrete support column in the middle of the roadway under the GC&SF structure, and to the lack of sidewalks, which forced pedestrians to step into the roadway. More problematic, however, was the general increase in traffic that resulted from rapid urban growth and industrialization.[3]

After a brief depression following the end of the First World War, the United States experienced a period of economic expansion that began about 1922, peaked in 1927, and lasted until the beginning of the Great Depression in 1929. This period marked the climax of the so-called "second industrial revolution," an era in which the nation's industrial output nearly doubled and the gross national product rose by approximately forty percent. Electrification, new technologies, more efficient manufacturing methods, and innovative advertising fueled the rise in the consumer-goods economy that gave Americans the highest standard of living in the world.[4]

Automobile manufacturing had already become the nation's largest industry by 1920, and continued to experience spectacular growth throughout the decade. In 1920, there were 9,239,100 motor vehicle registrations in the United States; by 1930, the total had increased to 26,749,800. With more cars and trucks on the road, more and better highways were required, and millions of dollars were spent during the 1920s to upgrade the nation's road system. The pace of road improvement did not keep pace with the rise in automobile ownership, however.

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[2] J. A. L. Waddell, *Bridge Engineering*, vol. 1 (New York: John Wiley & Sons, Inc., 1916), 408.

[3] For a more thorough history offered by the historian similarly in many histories on the Texas Historic Bridges Recording Project please see: U.S. Department of the Interior, Historic American Engineering Record (HAER), No. TX-89, "Stockyards Viaduct," 2000, Prints and Photographs Division, Library of Congress, Washington, D.C.

[4] Robert A. Divine, ed., *America: Past and Present*, vol. 2, 2nd ed. (Glenview, Ill.: Scott, Foresman and Co., 1987), 723-24.

There were approximately 387,000 mile of paved roads in the United States in 1921, but the figure had increased to only 662,000 by 1929.[5]

Texas followed national trends with an increase in motor vehicle registrations from 430,377 in 1920, to 1,401,748 in 1930.[6] Moreover, these vehicles were traveling at a much higher rate of speed, thereby increasing the hazard to the motoring public. Unfortunately, increase in the number and speed of vehicles on the road in the 1920's exceeded the Texas Highway Department's capacity to keep pace with necessary highway improvements. As later noted by an article published in *Texas Parade*, the official publication of the Texas Good Roads Association, during this period "more vehicles, traveling more miles, were turned loose on an already inadequate highway system."[7]

When traffic on the state's highways during the earliest years of the century was relatively light and the average speed relatively low, there seemed to be little need for the construction of grade separation structures, except in those cases where a major highway or trunk line railroad with very heavy traffic was involved.[8] Because grade separation structures were very expensive, the Texas Highway Department generally elected to provide for increased safety of the motoring public by relocating highways, by improving the grade of the crossings, by cutting brush to increase sight distance, or by erecting more effective warning signs.[9] But as the number of accidents involving injury or death at highway-railroad crossings in Texas rose steadily from 201 incidents (68 fatalities) in 1920 to 350 incidents (152 fatalities) in 1929, the importance of separating the grades of highways and rail lines became more apparent.[10]

In 1923, the Texas Railroad Commission collected data from railroad companies operating in the state and found that there were 9,313 public road and farm crossings and 533 street crossings in Texas, but only 165 overpasses and underpasses. Most of the crossing elimination achieved up to this time was due to road relocation, with some of the cost covered by federal funds made available under provisions of the various Federal Aid Acts passed beginning in 1916.

During the 1920's, some of the leading railroad companies began to employ engineers for

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[5] Divine *America: Past and Present, 723-24*; Gary B. Nash and Julie Roy Jeffrey, eds., *The American People: Creating a Nation and a Society,* vol. 2 (New York: Harper & Row, 1986), 761-62.

[6] *Texas Highway Department Ninth Biennial Report: September 1, 1932 to August 31, 1934* (Austin, Tex.: Texas Highway Department, 1934), 31.

[7] Charles E. Simmons, "Engineering Death Off the Highways," *Texas Parade* (August 1938), 16.

[8] H. H. Allen, ed., *Texas Highway Department: 1927-1937* (Austin, Tex.: Texas Highway Department, 1937), 113.

[9] G.G. Wickline, "Grade Crossing Elimination," *Texas Highway Bulletin 4* no. 1 (January 1924): 25; "Making Texas Highway Safe for Traffic with the Grade Crossing Eliminated," *Texas Highway Bulletin* 8, no. 4 (April 1928):9.

[10] Allen, *Texas Highway Department: 1927-1937*, 113; *Texas Highway Department Ninth Biennial Report: September 1, 1932 to August 31, 1934* (Austin, Tex.: Texas Highway Department, 1934), 8.

the special purpose of conferring with state and county officials on the construction of grade separation structures. But cost participation by the railroads during this period was entirely voluntary.[11] Prior to 1925, when the state or a county desired construction of a grade separation structure, a plan was submitted to the railroad and negotiations were begun regarding the design and cost. Generally, the railroad paid one-half of the cost on any portion of the project within railroad right-of-way, but only contributed about one-third of the cost for work outside their right-of-way.

In 1925, the Texas legislature passed laws by which the county were relieved of construction responsibilities, and from 1925 to 1932 the railroads and the state of Texas split the cost of grade crossing elimination. Passage of the Emergency Relief Appropriations Act of 1932 provided federal funds for the entire cost of grade separation structures, payable through the state.[12] The availability of federal funds allowed the Texas Highway Department and the U.S. Bureau of Public Roads to finally begin a systematic program of new construction and improvement of existing urban separation structures, and a great number were built in the 1930s.

Prior to 1932, the individual railroad company involved prepared plans for an underpass and performed the work itself. After the work was completed and inspected, the state reimbursed the railroad based on the formula agreed to before commencement of construction. In the case of the overpass, the state prepared the design and an outside contractor performed the actual work of construction in the same manner as any other state highway improvement project. After 1932, the state generally accepted responsibility for preparation of a preliminary plan, which was then submitted to the railroad. With input from the U.S. Bureau of Public Road, the railroad then prepared final plans for underpasses, and the state prepared final plans for overpasses. After the U.S. Bureau of Public roads approved a final design, an outside contractor performed the work under supervision by the state.[13]

Because the Gulf, Colorado & Santa Fe Underpass is a replacement of an earlier grade separation structure, the procedures for its design and construction reflected the practices in place both before and after 1932. Upgrade of all the grade separation structures on East Rosedale Avenue between South Main Street and Renner Street began with the International-Great Northern Railroad (I-GN) Underpass, located approximately 4,400' east of the GC&SF underpass.[14] Texas Highway Department engineer Gibb Gilchrist submitted reconstruction plans to C. E. Swain, district engineer for the Fort Worth office of the U.S. Bureau of Public Roads, in 1934. Swain responded by informing Gilchrist that all of the underpasses along the affected

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[11] Wickline, G.G. "Grade Crossing Elimination."

[12] *Texas Highway Department Seventh Biennial Report: September 1, 1928 to August 31, 1930* (Austin, Tex.: Texas Highway Department, 1934), 56; Allen, 115.

[13] Allen, H. H. *Texas Highway Department: 1927-1937*, 116.

[14] The International and Great Northern Railroad became the International-Great Northern Railroad in 1922.

stretch of road would have to be modified to complete the connection.[15] At first Gilchrist resisted, claiming that work on the I-GN Underpass should not be held up, and that the other underpasses could be rebuilt at a later time. It was eventually determined, however, that the GC&SF Underpass would have to be rebuilt due to obstructing support center piers in the roadway, and the MKT Underpass would have to be raised due to inadequate vertical clearance. The H&TC Underpass, though somewhat deficient in horizontal clearance, was deemed adequate and did not require immediate reconstruction.

Texas Highway Department Division Engineer M. C. Welborn was placed in charge of developing specific reconstruction or alteration plans, in concert with design engineers of the two railroads involved. The MKT Underpass alteration was a relatively easy task, which involved jacking up the two existing deck plate girder spans, placing additional steel-reinforced concrete at the bridge seats, and resetting the spans on the new seats. The existing integrated wingwalls also had to be strengthened by the addition of reinforced concrete.

Reconstruction of the GC&SF Underpass, however, was a different matter. The existing center pier, the timber approach trestles, and the 57'-4" steel deck plate girder span were removed. A new 57'-4" steel deck plate girder span, fabricated by the Virginia Bridge & Iron Company of Roanoke, Virginia, was erected on a concrete bent (north side) and a box-type concrete abutment (south side).

The girder is of a typical built up design, with a web plate sandwiched between riveted flange angles at the top and bottom of the plate. Cover plates are also riveted to the flange plates at the top and bottom of the web plate. Additional cover plates on the bottom flange stiffen the girder, which is three plates thick at the center of the span. The girder is also made more rigid by angles riveted vertically along the length of the web plate. The plates are cross-braced by angles, connected to the cover plates by riveted gusset plates.

The rail deck consists of creosoted cross-timbers (ties) resting directly on the top flanges of the plate girders. The tracks rest on top of the ties, and are held in place by metal brackets. Longitudinal wooden beams are also bolted to the top of the ties. Wooden handrails are located on either side of the deck, and a narrow walkway is located on the west side of the deck. It is assumed that parts of the rail deck have been replaced since original construction of the underpass.

New approach trestles on timber bents were constructed at each end. The piles of a north-side timber bent, cut off so that they do not touch the structure erected in 1935, are all that remain of the original underpass.

In January 1935, after preliminary design plans for the new underpass had been developed, Welborn wrote to Gilchrist, stating that sidewalks had not been provided for in the plans and should be included. U.S. Bureau of Public Roads Assistant Engineer A. C. Taylor, who inspected the site the following month, bolstered this opinion. He found that the existing path used by pedestrians ran between the roadway and the piers of the three structures. In his field report, Taylor noted the remarks of a teacher at James E. Guinn School, a large school for

[15] U.S. Bureau of Public Roads Fort Worth District Engineer C. E. Swain to State Highway Engineer Gibb Gilchrist, 5 July 1934, Letter in microfilmed project correspondence files of the Texas Department of Transportation, Records Management Division, Austin, Tex.

approximately 1,400 African-American children, located immediately east of the MKT Underpass at 600 East Rosedale Avenue. Many of the students lived west of the GC&SF Underpass, and walked underneath the underpasses on their way to and from school. A child had recently been killed while walking past one of the structures, and several others had been injured. According to Taylor, the planned reconstruction of the GC&SF Underpass could make this problem worse, and he therefore called for a sidewalk and handrail on the south side of the street. This eventually resulted in construction of the box-type abutment on the south side of the underpass. A sidewalk also exists on the north side of the street, but this was probably a later addition.

The low bidder on the project, the West Texas Construction Company of Fort Worth, began work on 19 August 1935. The final inspection was conducted on 4 January 1936, and the Texas Highway Department accepted the structure on that date. The final cost of the project, which included both underpasses, brick paving of the street, and the addition of sub-surface storm drains, was $37,939.56. Of that total, $7,413.94 represented the work done on the GC&SF Underpass. The federal government paid the entire cost of the project under provisions of the Emergency Relief Appropriations Act of 1935.

Reconstruction of the GC&SF Underpass, along with changes to the affected roadway, was just one of the many street and highway related construction projects that changed the face of Fort Worth and helped make the city a modern metropolis during the Great Depression. The building boom that occurred in Fort Worth during the 1930s would not have been possible without the provision of federal funds, primarily through the U.S. Public Works National Recovery NRM Program. Although this specific project directly employed approximately fifty-three men, the National Recovery Program provided secondary employment to many more due to increased demand for materials such as concrete, brick, and steel.

The structure maintains its integrity, and is significant as an example of a systematic attempt by the Texas Highway Department and the U.S. Bureau of Public Roads during the 1930s to improve urban-area grade separation structures in response to the explosive growth of automobile and truck traffic during the early decades of the twentieth century. It also serves as an example of the Depression-era street and highway improvement building boom that helped make Fort Worth a modern metropolis.

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